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PATENT SPECIFICATION



Application Date: Feb. 21, 1938. No. 5339/38.

503,447

Complete Specification Left: Dec. 17, 1938.

Complete Specification Accepted: April 6, 1939.

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PROVISIONAL SPECIFICATION

Improvements relating to Spring Closing Devices and Check Mechanism for Doors

We, WILLIAM NEWMAN AND SONS LIMITED, a Company registered under the laws of Great Britain, and STEWART ADOLPHUS ROLLASON, British Subject, both of 268, Hospital Street, Birmingham, 19, do hereby declare the nature of this invention to be as follows:—

This invention relates to doors, either of the double action or single action type, and of that kind which are provided with spring means for automatically closing the same, and also with a fluid check device for delaying or retarding the closing action.

The object of the invention is to provide simple and efficient door closing and checking mechanism, wherein the check device acts quite independently of the spring and directly controls the closing movement of the door.

The invention consists in the provision of door closing and checking mechanism comprising a double cam member, one cam co-operating with a spring to effect the closing of the door, and the other cam acting upon a separate fluid check device which controls the closing movement of the door independently of the spring. The double cam device, which may form part of the door pivot, may be fixed, the spring and the check device (which latter may consist of a piston moving within an oil-containing cylinder) being carried by the door and moving relatively to the cams when the door is opened to cause the spring to be compressed and the oil to enter beneath the piston, the spring co-operating with the respective cam to close the door immediately it is released and the oil being then caused to pass through a restricted aperture to delay or retard the closing movement. The spring and check device may be disposed in planes at right-angles to one another, the spring being arranged horizontally and acting through rollers against the vertical face of a lower cam, and the check being disposed vertically and resting upon an upwardly-projecting top cam member. For double acting doors each cam member may have two faces one or other of which becomes operative according to the direction of open-

ing of the door.

Thus, in carrying out the invention, as described in connection with a double acting swing door adapted to turn about vertical pivot-pins, the lower inner corner of the door is fitted with an L-shaped metal shoe comprising vertical and horizontal channel portions, and this shoe forms a housing both for a spring for automatically closing the door and also for a fluid check device which delays or retards the closing movement. The fluid check device is separate from the spring and is housed within the vertical arm of the shoe, whilst the spring, which is of the coiled compression type, is located within the horizontal arm of the said shoe, and both the check device and the spring are controlled by cams disposed at the corner of the shoe and rigidly carried by a vertical pivot-pin, the latter having a square lower end and being fixed against rotation by a suitable floor plate or socket. The two cams and the vertical pivot-pin are formed as a single rigid unit, the one cam being disposed below the other, the lower of the two cams being arranged to control the spring and comprising a substantially drum-shaped eccentric boss cut away at one side to provide a substantially flat or slightly recessed surface, which is opposed to the spring when the door is in a closed position, each end of the said flat portion merging into an eccentrically curved vertical cam face. The spring is arranged horizontally within the horizontal arm of the shoe, its one end bearing against a rigid adjustable abutment in the said arm, whilst its other end bears against a movable plate or cap carrying a pair of horizontally-spaced rollers which engage the lower cam member, normally fitting against the flat part of the latter, one or other of the rollers, however, moving over one or other of the two curved cam faces of the said lower cam member, and so compressing the spring, according to the direction in which the door is opened.

The upper of the two cam members consists of a horizontal disc integral with or fixed to the lower cam and disposed immediately beneath the fluid check device

[Price 1/-]

in the vertical arm of the shoe, the top face of the said upper cam comprising two curved surfaces, extending upwardly from a substantially flat portion and providing a V-sectioned upstanding rib or peak radial to the centre of the pivot-pin. The two cam surfaces of the said upper cam are adapted to be engaged by a roller upon the underside of the cylinder of the check-device, the roller resting upon the peak of the cam when the door is closed and moving down over either cam surface when the door is opened, according to the direction of the opening. The cylinder of the check device is externally of a square section, so that it fits between the sides of the vertical arm of the shoe and is prevented from turning, being, however, capable of sliding freely between the said sides in a vertical direction. The said cylinder, which is partly filled with oil, houses a closely fitting piston carried by a rod passing up through the upper end of the cylinder, the said upper end of the latter being screwthreaded and fitted with a gland cap which extends around and forms a guide for the projecting piston stem. The upper end of the piston stem terminates in a disc or head which is kept pressed up against an adjustable abutment by a spring surrounding the piston stem, the top of the spring bearing against the said head and the lower end of the spring engaging the aforesaid gland cap of the cylinder. The arrangement is such that the opening and closing of the door causes the roller at the lower end of the cylinder (which moves with the door) to travel over one of the cam surfaces, the cylinder being thus raised and lowered and causing a relative movement of the piston, since the piston stem is always maintained by the spring up against the abutment. The piston is provided with a one-way ball valve which allows oil to pass freely from the top of the piston to the underside of the latter, as the cylinder moves down, and the piston moves (in a relative sense) to the top of the cylinder; whilst when the cylinder moves upwards and the piston passes back to the lower part of the cylinder, the oil is caused to be forced through a restricted aperture in the piston, thus giving a retarding action. When the door is closed the spring is inactive, the roller of the spring engaging the flat part of the lower cam, whilst the cylinder of the check device is supported by its roller upon the peak of the upper cam. When the door is opened in either direction the spring and check device turn with the door, and the roller of the spring rides over one of the curved eccentric faces of the lower cam, so that the spring is compressed. At the same time, the

roller of the check device rides down from the peak of the upper cam, so that the check cylinder is lowered relatively to the piston which remains stationary. The oil, therefore, passes to the underside of the piston through the one-way valve. When the door is released the spring expands, the roller of the spring co-operating with the lower cam, so that the door is automatically closed. During this closing movement the cylinder roller is caused to ride up towards the peak of the top cam, thus raising the cylinder, and causing the piston to pass towards the lower end of the latter, the oil below the piston being expelled, as stated, through the restricted aperture, thus retarding the closing of the door. The size of the restricted aperture may be gradually lessened by a tapering pin or needle carried by the bottom of the piston, so that the retarding action is gradually increased as the door approaches its closed position. A relief valve, consisting of a spring-pressed ball, may be provided in the piston and which opens only if undue pressure is used to close the door, thereby preventing damage to the mechanism.

When the door is opened and closed in the opposite direction the rollers of the check device and spring ride over the other faces of their respective cams, the action during the opening and closing being the same as above described. In either case the action of the check device is quite separate from that of the spring. The top abutment for the piston stem may screw into a plate extending between the sides of the shoe, and by adjusting the abutment the relative positions of the piston and cylinder at any instant during the closing of the door may be varied, thus varying the extent of the closing of the restricted aperture by the taper pin and the extent of the retarding action.

Instead of the mechanism being disposed at the bottom corner of the door it may be housed within a shoe fitting over the top inner corner of the door, the arrangement, so far as the double cam member and the check device is concerned, being inverted. Thus, the double cam member, shaped as previously described, is formed as a part of the top pivot, the cam for operating the check being, in this case at the bottom, with the peak of the cam presented downwards and engaging a roller on the upper end of the piston stem, instead of on the cylinder. The latter, on the other hand, rests on an adjustable abutment, so that the height of the cylinder, and the extent to which the restricted orifice may be engaged by the taper pin, may be varied. When the door is opened the roller on the piston stem

rides up the cam surface, the piston being moved up within the cylinder by a spring surrounding the piston stem, the oil then entering below the piston, the movement
 5 being reversed when the door is being closed by the spring, so that the oil is forced through the restricted orifice. The spring is housed in the top horizontal arm of the shoe, and is controlled by a cam
 10 as previously described.

The invention may be applied to single action doors, that is to doors opening in one direction only, in the same way, the mechanism being arranged either at the
 15 top or bottom inner corner of the door, the sole difference being that each cam member would be provided with a single cam face only. The pivot pin by which the cams are carried may, however, be
 20 offset from the vertical central plane of the door, the shoe being shaped accordingly.

The top of the oil cylinder of the check device may be closed by a gland nut
 25 screwing into the cylinder and comprising

an externally-threaded cup-shaped part, the bottom of the cup having a central circular hole for engaging closely around the stem of the piston, the said piston stem also passing through a packing disc
 30 of leather or other material in the upper part of the cup. This packing disc may be supported by a plate resting on an annular internal shoulder near the top of the cup member, which also carries a top
 35 pressure plate for screwing down on to, and compressing, the packing material. The bottom of the cup is spaced vertically from the packing material and is formed with drainage holes, the arrangement
 40 being such that any oil which finds its way past the bottom of the cup member is intercepted by the packing and flows back into the cylinder through the drainage
 45 holes.

Dated this 19th day of February, 1938.

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COMPLETE SPECIFICATION

Improvements relating to Spring Closing Devices and Check Mechanism for Doors

We, WILLIAM NEWMAN AND SONS LIMITED, a Company registered under the laws of Great Britain, and STEWART ADOLPHUS ROLLASON, British Subject,
 50 both of 268, Hospital Street, Birmingham, 19, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the
 55 following statement:—

This invention relates to doors, either of the double action or single action type, and of that kind which are provided with spring means for automatically closing the same, and also with a fluid check device for delaying or retarding the closing
 60 action.

The object of the invention is to provide simple and efficient door closing and checking mechanism, wherein the check device acts quite independently of the spring and directly controls the closing
 65 movement of the door.

According to the invention, door closing and checking mechanism comprises a shoe or casing adapted to be mounted upon a door, a double cam member mounted within the shoe or casing and adapted to be held stationary relatively to the floor
 70 or door frame, a closing spring or springs mounted upon or within the shoe or casing so as to move with the door and co-operating with one cam of the double cam
 75

member, and a fluid check device mounted upon or in the shoe or casing and co-
 80 operating with the other cam of the double cam member in order to be rendered operative, during the opening of the door, for checking the closing movement of the door under the influence
 85 of the spring or springs.

The double cam may comprise a face cam with an upwardly or downwardly presented operating face, and a peripheral cam having an operating periphery
 90 which is presented laterally. The two cams are fixed to or formed integral with, a common spindle adapted to form a stationary pivot about which the door may turn. The door closing spring or springs
 95 and the check device may conveniently be disposed at right-angles to one another. The peripheral cam may be arranged to act upon the door closing spring or springs, so that the latter is compressed
 100 when the door is opened, while the face cam acts on the check device to render the latter operative to retard the closing of the door when the same is released. For double acting doors each cam member
 105 may have two faces one or other of which becomes operative according to the direction of opening of the door.

Figure 1 of the accompanying drawings represents a vertical section through a
 110 door closing and check device constructed

in accordance with this invention and suitable for a double acting swing door, showing the double cam in side elevation, the parts being in the positions they assume when the door is closed.

Figure 2 is an end view of the shoe or casing housing the mechanism.

Figure 3 is a horizontal section through the lower arm of the shoe or casing, with the top cam in plan, showing the roller of the check device engaging the same.

Figure 4 represents a perspective view of the double cam device.

Referring to the drawings, the lower inner corner of the door 1 is fitted with an L-shaped metal shoe 2 comprising vertical and horizontal channel portions, and this shoe contains not only springs 3 for automatically closing the door, but also a fluid check device which delays or retards the closing movement. The fluid check device is separate from the springs 3 and is disposed within a housing 4 in the vertical arm of the shoe 2, whilst the springs 3, which are of the coiled compression type, are contained within a housing 5 in the horizontal arm of the said shoe. The check device and the said springs 3 are respectively controlled by cams 6 and 7 disposed at the corner of the shoe 2 and rigidly carried by a vertical pivot-pin 8, the latter having a square lower end 8^a and being fixed against rotation by a suitable floor plate or socket 9. The upper end 8^b of the pivot pin engages a bearing in an extension of the spring housing 5. The two cams 6 and 7 and the vertical pivot-pin 8 are formed as a single integral or rigid unit, the one cam being disposed below the other, the lower cam 7 being arranged to control the springs 3 and comprising a substantially drum-shaped eccentric boss cut away at one side, at 7^a, to provide a substantially flat or slightly recessed surface, which is opposed to the springs 3 when the door is in a closed position, each end of the said flat portion merging into an eccentrically curved vertical cam face. The springs 3 are arranged horizontally, as shown, bearing at one end against rigid abutments 10 and 11, the latter being adjustable, whilst they bear at their other end against a movable part 12 carrying a pair of horizontally-spaced rollers 13 which engage the lower cam member 7 normally fitting against the flat part 7^a of the latter, one or other of the rollers 13, however, moving over one or other of the two curved cam faces of the said lower cam member, when the door 1 is being opened, and so compressing the springs 3, according to the direction of movement of the door.

The upper cam member 6 consists of a horizontal disc integral with or fixed to

the lower cam 7 and disposed immediately beneath the fluid check device in the housing 4, the top face of the said upper cam comprising two curved surfaces, extending upwardly from a substantially flat portion and providing a V-sectioned up-standing rib or peak 6^a radial to the centre of the pivot-pin 8. The two cam surfaces of the said upper cam 6 are adapted to be engaged by a roller 14 upon the underside of a cylinder or piston casing 15 which forms part of the check-device, the roller 14 resting upon the peak 6^a of the cam when the door is closed and moving down over either cam surface when the door is opened, according to the direction of the opening. The cylinder or piston casing 15 of the check device is externally of a square section, so that it fits between the sides of the vertical arm of the shoe 2 and is prevented from turning, being, however, capable of sliding freely between the said sides within its housing in a vertical direction. The said cylinder or piston casing, which is partly filled with oil, houses a closely-fitting piston 16 carried by a rod 17 passing up through the upper end of the cylinder or piston casing 15, the said upper end of the latter being screwthreaded and closed by a gland nut 18 which extends around and forms a guide for the projecting piston stem. The upper end of the piston stem 17 terminates in a disc or head 17^a which is kept pressed up against an adjustable abutment 19 by a spring 20 surrounding the piston stem, the top of the spring 20 bearing against the disc or head 17^a and the lower end of the said spring engaging the aforesaid gland nut 18 of the cylinder. The arrangement is such that the opening and closing of the door 1 causes the roller 14 at the lower end of the cylinder or piston casing (which moves with the door) to travel over one of the inclined surfaces of the cam 6, the piston casing being thus raised and lowered and causing a relative movement of the piston 16, since the piston stem 17 is always maintained by the spring 20 up against the abutment 19. The piston 16 is provided with a one-way ball valve 21 which allows oil to pass freely from the top of the piston to the underside of the latter, as the cylinder or piston casing 15 moves down, and the piston 16 moves (in a relative sense) to the top of its casing; whilst when the cylinder or piston casing 15 moves upwards and the piston 16 passes back to the lower part of the cylinder, the oil is caused to be forced through a restricted passage 22 in the piston, thus giving a retarding action.

When the door 1 is closed the closing springs 3 are inactive, the roller 13 of the said springs engaging the flat part 7^a of

the lower cam, whilst the cylinder or piston casing 15 of the check device is supported by its roller 14 upon the peak 6^a of the upper cam 6. When the door is opened in either direction the springs 3 and check device turn with the door, and one of the rollers 13 of the closing springs rides over one of the curved eccentric faces of the lower cam 7, so that the said springs 3 are compressed. At the same time, the roller 14 of the check device rides down from the peak of the upper cam 6, so that the check cylinder or piston casing 15 is lowered relatively to the piston 16 which remains stationary. The oil, therefore, passes to the underside of the piston 16 through the one-way valve 21. When the door is released the springs 3 expand, the roller 13 of the said springs co-operating with the lower cam 7, so that the door is automatically closed. During this closing movement the cylinder roller 14 is caused to ride up towards the peak 6^a of the top cam 6, thus raising the cylinder 15 and causing the piston 16 to pass towards the lower end of the latter, the oil below the piston 16 being then expelled, as stated, through the restricted passage 22, thus retarding the closing of the door. The size of the restricted passage 22 may be gradually lessened by a tapering pin or needle 23 carried by the bottom of the cylinder 15, so that the retarding action is gradually increased as the door approaches its closed position. A relief valve, consisting of a spring-pressed ball 24, may be provided in the piston, this valve opening only if undue pressure is used to close the door, thereby preventing damage to the mechanism.

When the door 1 is opened and closed in the opposite direction the rollers 13 and 14 of the springs and check device ride over the other faces of their respective cams, the action during the opening and closing being the same as above described. In either case the action of the check device is quite separate from that of the door closing springs. The top abutment 19 for the piston stem 17 may screw into a part 25 extending between the sides of the shoe, and by adjusting the said abutment the relative positions of the piston 16 and cylinder 15 at any instant during the closing of the door may be varied, thus varying the extent of the closing of the restricted passage 22 by the taper pin 23 and the extent of the retarding action.

The gland nut 18 which closes the top of the piston casing or cylinder 15 may comprise, as shown, an externally-threaded cup-shaped lower part, the bottom of the cup having a central circular hole for engaging closely around

the stem 17 of the piston, the said piston stem also passing through a packing disc 26 of leather or other material in the upper part of the cup. This packing disc may be supported by a plate 27 resting on an annular internal shoulder near the top of the cup member, which also carries a top pressure member 28 for screwing down on to, and compressing, the packing material. The bottom of the cup-shaped gland nut 18 is spaced vertically from the packing material 26 and may be formed with drainage holes 29, the arrangement being such that any oil which finds its way past the bottom of the cup member is intercepted by the packing and flows back into the cylinder through the drainage holes.

Instead of the mechanism being disposed at the bottom inner corner of the door it may be housed within a shoe adapted for fitting over the top inner corner of the door, the arrangement, so far as the double cam member and the check device is concerned, being inverted. Thus, the double cam member, shaped as previously described, would be formed as a part of the top pivot, the cam for operating the check being, in this case at the bottom, with the peak of the cam presented downwards and engaging a roller on the upper end of the piston stem, instead of on the cylinder. The latter, on the other hand, could rest on an adjustable abutment, so that the height of the cylinder, and the extent to which the restricted passage or orifice may be engaged by the taper pin, may be varied. When the door is opened the roller on the piston stem would, in this arrangement, ride up the cam surface, the piston being moved up within the cylinder by a spring surrounding the piston stem, the oil then entering below the piston, the movement being reversed when the door is being closed by the spring, so that the oil is forced through the restricted passage. The closing springs would be housed in the top horizontal arm of the shoe, being controlled by a cam as previously described.

The invention may be applied to single action doors, that is to doors opening in one direction only, in the same way, the mechanism being arranged either at the top or bottom inner corner of the door, the sole difference being that each cam member would be provided with a single cam face only. The pivot pin by which the cams are carried may, however, be offset from the vertical central plane of the door, the shoe being shaped accordingly.

Having now particularly described and ascertained the nature of our said inven-

tion and in what manner the same is to be performed, we declare that what we claim is:—

1. Door closing and checking mechanism comprising a shoe or casing adapted to be mounted upon a door, a double cam member mounted within the shoe or casing and adapted to be held stationary relatively to the floor or door frame, a closing spring or springs mounted upon or within the shoe or casing so as to move with the door and co-operating with one cam of the double cam member, and a fluid check device mounted upon or in the shoe or casing and co-operating with the other cam of the double cam member in order to be rendered operative, during the opening of the door, for checking the closing movement of the door under the influence of the spring or springs.

2. Closing and checking mechanism for doors, as claimed in claim 1, wherein the double cam comprises a face cam with an upwardly or forwardly presented operating face, and a peripheral cam having an operating periphery which is presented laterally.

3. Closing and checking mechanism for doors, as claimed in claim 2, wherein the two cams are fixed to, or formed integral with, a common spindle adapted to form a stationary pivot about which the door may turn.

4. Closing and checking mechanism for doors, as claimed in any one of the preceding claims, wherein the door closing spring or springs and the check device are disposed at right-angles to one another.

5. Closing and checking mechanism for doors, as claimed in claim 2, wherein the

peripheral cam is arranged to act upon the door closing spring or springs, so that the latter is compressed when the door is opened, while the face cam acts on the check device to render the latter operative to retard the closing of the door when the same is released.

6. Closing and checking mechanism for doors, as claimed in any one of the preceding claims, wherein the door closing spring or springs and the check device are housed within an L-shaped shoe or attachment part, the horizontal arm of the latter forming a housing for the door closing spring or springs, so that they may be compressed by the one cam, and the vertical arm of the shoe or attachment part forming a housing for the check device which co-operates with the other cam.

7. Closing and checking mechanism for doors, as claimed in claim 5, wherein the check device comprises a vertically-movable cylinder or casing containing a piston and having a roller at its end for engaging the face cam member, the said cylinder or piston casing being permitted by the latter to move vertically when the door is opened to allow oil to pass the piston, the oil being forced through a restricted aperture in the latter during the closing of the door.

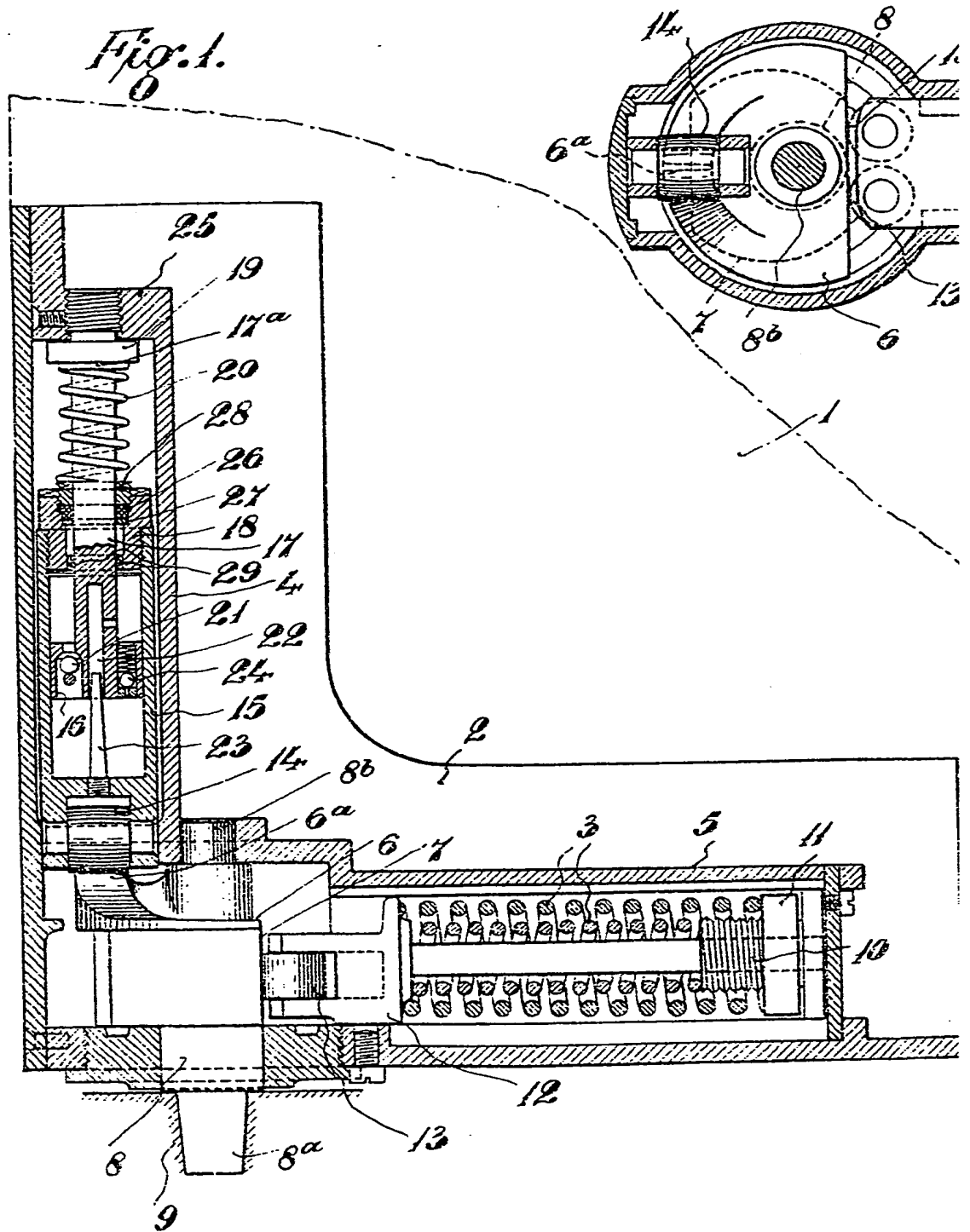
8. Closing and checking mechanism for doors, substantially as herein described with reference to the accompanying drawings.

Dated this 16th day of December, 1938.

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Agents for Applicants.

Fig. 1.

[This Drawing is a reproduction of the Original on a reduced scale.]



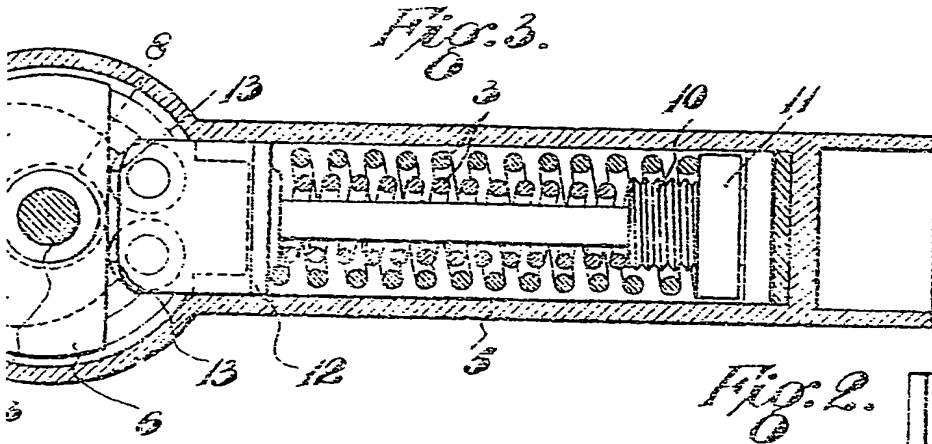


Fig. 2.

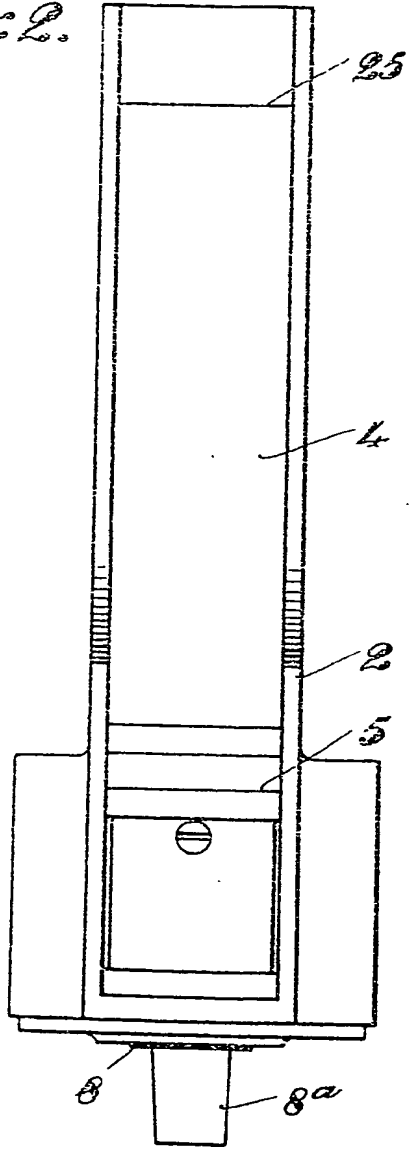
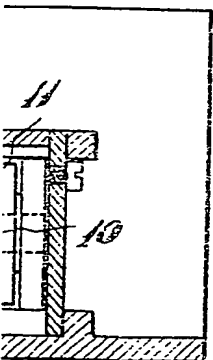
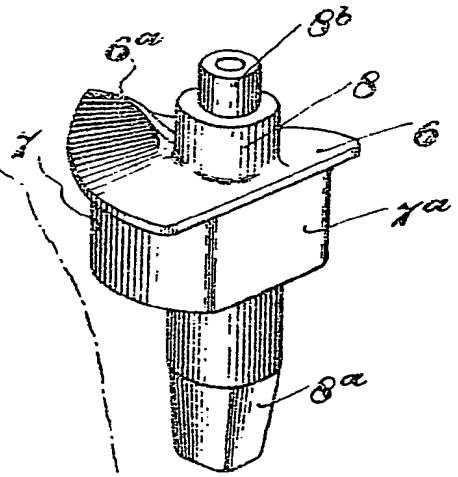
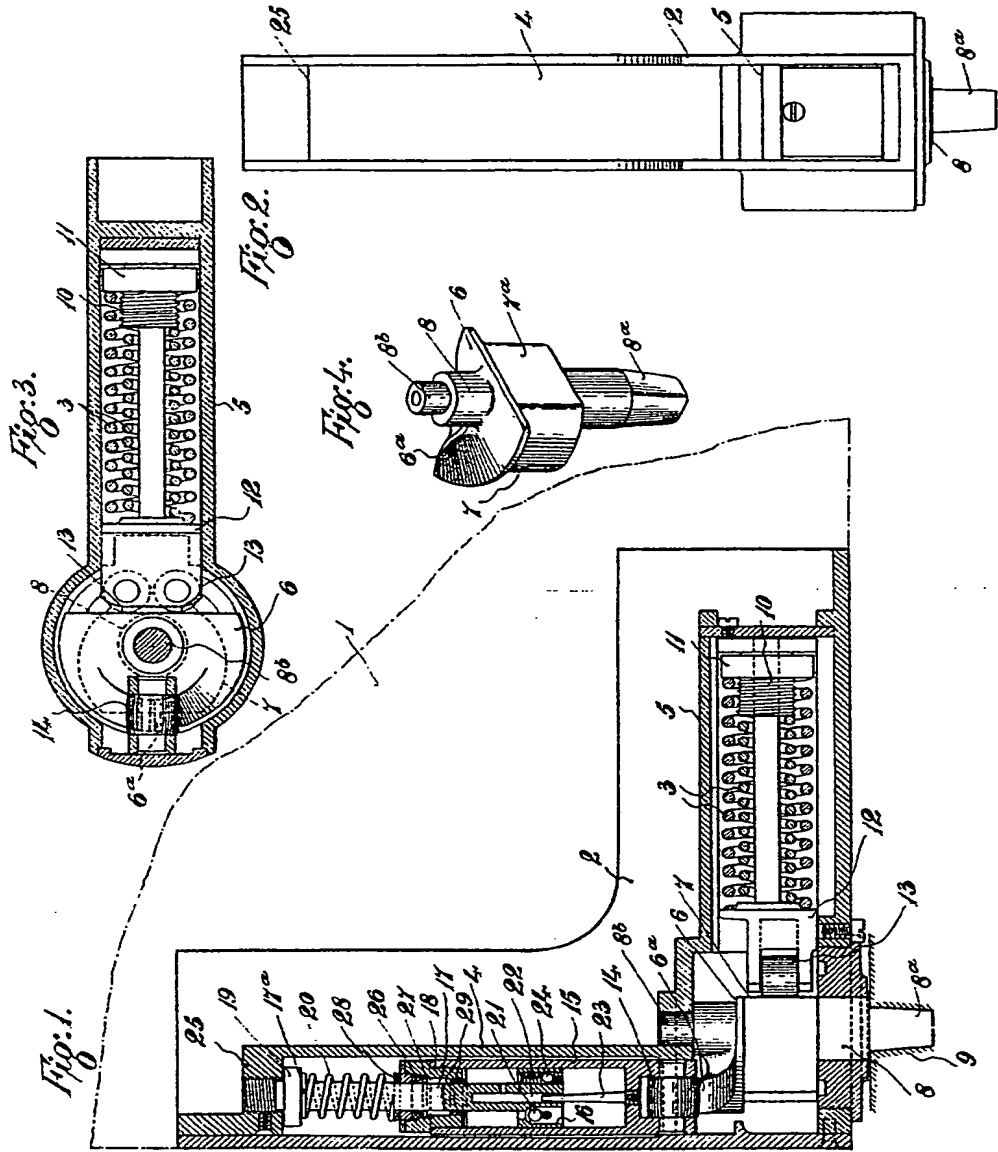


Fig. 4.





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